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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/871,039	05/31/2001	Kevin Colbow	13145US01	9017

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EXAMINER

WINTER, GENTLE E

ART UNIT	PAPER NUMBER
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1746

DATE MAILED: 10/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/871,039

Applicant(s)

COLBOW ET AL.

Examiner

Gentle E. Winter

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 02 October 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-30 are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-21, drawn to a method of improving the performance of a direct feed fuel cell, classified in class 429, subclass 13.
  - II. Claims 22-30 drawn to PEM fuel cell, classified in class 429, subclass 34.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case the product as claimed can be used in a materially different process of using that product, specifically, the cell of the apparatus could be used to provide a constant power output.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with Robert W. Fieseler on or about 9/12/03 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-21. Affirmation of this election must be made by applicant in replying to this Office action. Claims

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22-30 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1, 2, 5, 6, 7, 8, are rejected under 35 U.S.C. 102(a) as being anticipated by United States Patent No. 6,096,448 to Wilkinson et al. (Wilkinson).

6. With respect to claims 1, 6, and 7 disclosing a method of improving the performance of a direct feed fuel cell. The same is disclosed at e.g. column 3, line 15 *et seq.* Claim 1 further goes on to indicate that the direct feed fuel cell has an anode comprising a CO-tolerant catalyst. In claims 6 and 7 the CO-tolerant catalyst is disclosed as platinum-ruthenium catalyst, the same is disclosed at column 12, line 10 *et seq.* Claim 1 goes on to indicate that the direct feed fuel cell includes a solid polymer electrolyte and a cathode. The same is disclosed at column 3, line 15 *et seq.* Claim 1 further indicates that the fuel cell is normally outputting power in a range from a minimum to a maximum output, comprising the steps of: providing a supply of fuel to the anode for the oxidation of the fuel to produce an oxidation product and electrons at the anode; providing a supply of oxidant to the cathode for reduction of the oxidant, thereby producing a reduction product; and reducing the output power of the fuel cell at predetermined time intervals

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to be less than the normal minimum output. The same is disclosed at column 2, line 65 *et seq.* describing, "fuel starving", and associated relevant drawing showing the associated output drops.

7. As to claims 2, disclosing that the output power of the fuel cell is periodically reduced at predetermined time intervals for 0.5-second durations at 5-second intervals. The same is disclosed in Wilkinson at column 11, line 43 *et seq.*

8. As to claim 5, disclosing that the normal maximum output and the normal minimum output is in a ratio of up to 60:1. This is inherent in the above-described fuel cell, which is indistinguishable from the claimed fuel cell. It is also noted that Applicant, quite correctly points out: "Typically, the ratio of the maximum power output to that of the minimum power output (or "turndown ratio") for such a fuel cell system is less than about 60."

9. As to claim 8, disclosing that reducing the output power of the fuel cell is effected by reducing the output current from the fuel cell at predetermined time intervals. The same is disclosed at column 3, line 19 *et seq.* Starving the cell of fuel will reduce the output of the current.

10. As to claim 9, disclosing that the output power is provided to an external circuit, the circuit being switchable between a closed circuit condition in which the flow of electric current is permitted and an open circuit condition in which the flow of electric current is interrupted and

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wherein reducing the output power of the fuel cell is effected by switching the circuit to the open circuit condition at predetermined time intervals. The same is disclosed at column 5, line 51 *et seq.* Specifically, Wilkinson discloses a switch that “periodically momentarily electrically connects the transient electrical load to draw electrical power from the fuel cell.”

11. As to claim 10, further limiting claim 9 and disclosing the step of interrupting the supply of fuel to the anode at predetermined time intervals when the output power of the fuel cell is reduced. The same is disclosed at column 5, line 39 *et seq.* Disclosing a “flow controller for periodically introducing pulses of the substantially fuel-free fluid into the fuel stream upstream of the fuel cell anode. The flow controller may comprise an interrupt valve for controlling the introduction of the substantially fuel-free fluid stream into the fuel stream.”

12. As to claim 11, further limiting claim 9 and disclosing the step of interrupting the supply of oxidant to the cathode at predetermined time intervals when the output power of the fuel cell is reduced. The same is disclosed at column 5, line 39 *et seq.* disclosing, “the interrupt valve may be fluidly connected to an oxidant stream outlet of the fuel cell.”

13. As to claim 12, further limiting claim 9 and disclosing that the cathode comprises platinum as catalyst. This feature is believed to be inherent; it is well known in the art that, solid polymer fuel cells commonly employ a platinum catalyst at the cathode and a platinum-ruthenium catalyst alloy at the anode. Nonetheless, Wilkinson discloses that the cathode comprises a platinum alloy catalyst. See column 14, line 54 *et seq.*

14. As to claim 13, further limiting claim 9 and disclosing that the fuel comprises methanol, the same is disclosed at column 3, line 61 *et seq.*

15. As to claim 14, further limiting claim 13 and disclosing a liquid aqueous methanol solution the same is disclosed at column 3, line 61 *et seq.*

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

16. Claims 3, 4, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 6,096,448 to Wilkinson et al.

17. As to claims 3 and 4, further limiting claims 2 and 3 respectively, and disclosing that the output power of the fuel cell is periodically reduced at predetermined time intervals and the predetermined time intervals are from about 0.5 hours to about 4 hours and with specific respect to claim 4, about 30 minutes. Each and every limitation of claims 3 and 4 are disclosed in Wilkinson as set forth above, except that Wilkinson fails to explicitly disclose that the output power of the fuel cell is reduced for about 30 minutes. Since reduced has been defined in the specification as including opening the load circuit. Wilkinson discloses the desirability and

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provides the motivation for adjusting both the frequency and duration of the interruptions see e.g. column 7, line 41 *et seq.* Specifically, Wilkinson discloses:

[T]he interruptions may be spaced at fixed time intervals or variable time intervals which are adjusted according to factors such as, for example, the concentration of poisons to which the anode electrocatalyst is exposed, and the configuration of the flow field. For example, for fuel cells subjected to lower poison concentrations, it is possible to lengthen the intervals between periodic fuel supply interruptions.

18. Wilkinson, however does not disclose specifically disclose “about half an hour” as the required interval. Thus Wilkinson discloses the claimed invention except for indicated time interval. It would have been obvious to one having ordinary skill in the art at the time the invention was made to select about 30 minutes to four hours since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Wilkinson says as much at column 7, line 41 *et seq.*, as set forth above, disclosing: “With respect to frequency, the interruptions may be spaced at fixed time intervals or variable time intervals which are adjusted according to factors such as, for example, the concentration of poisons to which the anode electrocatalyst is exposed, and the configuration of the flow field.” And continues: “For example, for fuel cells subjected to lower poison concentrations, it is possible to lengthen the intervals between periodic fuel supply interruptions.” And at column 4, line 41, Wilkinson discloses: “[T]he method may comprise monitoring an operational parameter of the fuel cell and adjusting the frequency with which the momentary fuel starvation is induced in response to the value of the monitored parameter. Similarly, the duration of the momentary fuel starvation may be fixed or varied, for example in response to a monitored operational parameter.” Thus explicitly providing the motivation for adjusting the time period. In a larger sense the cell would almost certainly be turned off for intervals ranging for ½ to 4 hours.



19. As to claim 15, further limiting claim 9 and disclosing that the circuit is switched to the closed position for a period of greater than about 30 minutes. Virtually every fuel cell that was shut off for at least 30 and restarted, at least once. Consider a fuel cell in a commuter vehicle.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. Claim 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 6,096,448 to Wilkinson *et al.* and United States Patent No. 3,300,345 to Lyons *et al.* (Lyons). As to claim 16, further limiting claim 9, each and every limitation of claim 16 is disclosed in Wilkinson as set forth above, except that Wilkinson fails to explicitly disclose that the circuit is switched to the open position for a period of less than about 30 seconds. Any time less than 30 seconds would suffice. Column 4, line 36 discloses interrupting the circuit 182 times a second. Lyons further discloses 3 cycles (on/off) per second at column 5, line 3 *et seq.* The artisan would have been motivated to make the combination at the time of the invention for the reasons explicitly set forth in Wilkinson, namely removal of electrocatalyst poisons from the anode.

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21. As to claim 17, further limiting claim 9 and disclosing that the step of reducing the output power of the fuel cell at predetermined time intervals comprises the steps of: operating the cell to provide electric current in the circuit for an operating period of about 0.5 to 4 hours; opening the circuit to terminate the flow of electric current for a rest period of about 1 second to 30 minutes column 6, line 38 *et seq.* and ramping the current to increase from zero to a working value for a ramping period of up to 5 minutes. Again, it is noted that “up to 5 minutes” includes any value less than five minutes. The figures 4-8 demonstrate the disclosed “ramping”. It is noted that the claim does not disclose a “variable load” as disclosed in column 5, line 34 *et seq.* of Lyons. Additionally, it is noted that Wilkinson discloses a capacitor. The ramping is disclosed to result in a longer life for the electrode.

22. As to claim 18, further limiting claim 17, and disclosing that the operating period has a duration of greater than about 30 minutes. Most automotive fuel cells are operated for more than about 30 minutes. The artisan would have been motivated to operate a fuel cell for more than 30 minutes because shutting a fuel cell down usually requires an inert-gas electrode-blow-off, and because the artisan would need power for a period exceeding 30 minutes.

23. As to claim 19, further limiting claim 17, and disclosing that the rest period has a duration of less than about 30 seconds. This is identically disclosed in Lyon and Wilkinson. A shorter duration, but effective period allows for greater power density. See column 12, line 9 *et seq.*

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24. As to claim 20, further limiting claim 17, and disclosing that the ramping period has a duration of less than about 2 minutes. As indicated above, a results effective period would be selected. Less than one second is disclosed, in *inter alia* Wilkinson in figure 8 and relevant associated text and at column 5, line 53 *et seq.* discussing a “transient electrical load” to draw power from a fuel cell.

25. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson, Lyons, and of PGPub US 20020083640 to Finkelshtain. Claim 21, further limiting claim 17, and disclosing that the ramping period has a duration of greater than about 10 seconds. This would inherently occur as the cell is pressed into service, draw is ramped as a function of the cells’ capacity to meet the demand resulting from the load. This is illustrated in figure 3A of PGPub US 20020083640.

### ***Conclusion***

26. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gentle E. Winter whose telephone number is (703) 305-3403. The examiner can normally be reached on Monday-Friday 7:00-3:30.

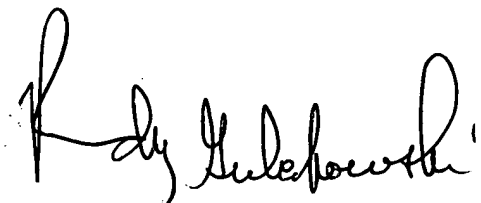
27. If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Randy P. Gulakowski can be reached on (703) 308-4333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications. The direct fax number for this examiner is (703) 746-7746.

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28. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gentle E. Winter  
Examiner  
Art Unit 1746

September 26, 2003

A handwritten signature in black ink, appearing to read "Randy Gulakowski". The signature is fluid and cursive, with a large initial "R" and "G".

RANDY GULAKOWSKI  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700